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Can Air Conditioners Spread COVID-19?

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Air conditioners on a building. Scientists say there has been too little research into the role of heating, ventilation and air conditioning systems in the spread of the coronavirus.

Sami Sarkis/Getty Images

In the dog days of August, air conditioning is everywhere.

Is that a problem when it comes to the spread of the coronavirus?

The answer to that question rests on the way the virus is transmitted — a topic that is still being researched.

Droplet transmission is considered the most common method: A virus-filled particle of breath or spittle comes out of the nose or mouth of an infected individual when they breathe, speak, cough or sneeze. These droplets generally disperse within a few feet of the person who expels them. But if they come into contact with someone's eyes, nose or mouth, they can transmit the virus.

Then there's aerosol transmission — when an infected person expels microscopic infectious particles so tiny that they linger in the air and spread from person to person in air currents. Since they are much smaller than droplets, aerosols can travel greater distances and get deep into the lungs of someone who inhales them.

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Among scientists, there is ongoing debate about the extent to which aerosol transmission causes infection. However, it has been generally accepted that it does occur, especially in closed indoor settings. Consequently, there's a possibility that air conditioning may be a potential route of transmission — sucking in virus particles

breathed out by an infected person and then blowing those infectious particles back out in the same room or even another room several floors away.

In fact, other infectious diseases such as measles, tuberculosis, chickenpox, influenza, smallpox and SARS have all been shown to spread through heating, ventilation and air conditioning systems.

But drawing definitive conclusions about the role that HVAC systems might play in spreading COVID-19 is difficult. There are only a few published studies looking at that issue, and experts admit there has been too little research into the role of HVAC systems in the spread of the novel coronavirus.

"We didn't focus on ventilation as much early on as we probably should have," says Abraar Karan, a physician and global health researcher at Harvard Medical School.



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What we do know is this: HVAC systems bring in outdoor air and send out an equal amount of indoor air as required by building codes. That air exchange is intended to dilute and remove contaminants such as particles, chemical emissions from building materials and emissions from people that cause odors. Many systems recirculate indoor air, which could in theory spread viral aerosol particles from one space to another, but there is no evidence to date that this has caused COVID-19 infections. This recirculation also helps to remove particles from the air when the recirculated air passes through filters before being returned to conditioned spaces.

In one study, which is available online as a pre-print and has not undergone scientific review, researchers in Oregon collected samples from various places inside a hospital's HVAC system and found genetic material from SARS-CoV-2, the virus that causes COVID-19. This demonstrates that it may be possible for the virus to be transmitted through HVAC systems.

However, researchers did not assess if the genetic material they found was able to cause infection, and they noted there were no confirmed COVID-19 cases associated

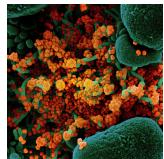
with the samples found in the ventilation systems.

There is currently no other evidence documenting the possibility of COVID-19 transmission through an air conditioning unit.

The bigger risk, says Edward Nardell, a professor of environmental health and immunology and infectious diseases at Harvard Medical School, is that hot weather outside causes people to seek air-conditioned comfort indoors. And indoors, there is less ventilation and more opportunity to spread disease.

"It is not the air conditioner that is doing anything particularly," Nardell says. "It is the fact that you are indoors, you are not socially distancing and you are rebreathing the air that people have just exhaled."

When you shut the doors and windows to keep the hot air outside, you are essentially eliminating the flow of fresh air so everyone in the room is breathing and rebreathing the same air. If someone in the room is infected with COVID-19, then they are breathing out the virus, which can linger in airborne droplets and be inhaled by another person, potentially causing infection.



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By comparison, if you were outside and near an infected person who breathed out some viral particles, there is a much larger volume of air flowing to disperse and dilute those particles quickly, reducing the risk of spread to another person nearby. That is why infectious disease experts consider outdoor gatherings and activities less risky than indoor ones (though not completely risk-free).

The other major risk is that air conditioning units, fans or even an open window can create strong enough air currents to move virus-containing droplets around a room. This happened in January at a restaurant in Guangzhou, China, where a person with COVID-19 infected five other people sitting at neighboring tables from 3 to 6 feet away, according to a study by scientists from the Chinese Center for Disease Control and Prevention. After examining video footage of the diners who were infected and

simulating the transmission of the virus, scientists concluded that the small outbreak was caused by strong air currents from the air conditioning unit above the diners, which was blowing virus-containing aerosols from an infected person to those nearby. The restaurant also had no windows — and thus no ventilation bringing in fresh air and diluting virus particles in the air.



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The fact that aerosolized viral droplets can move in air currents in this way means that if you are in a room with an infected person and fresh air is not circulating, even if you are socially distancing to keep 6 feet apart at a minimum, you may not be safe, Nardell says. Although there are currently no published studies that have examined exactly how far airborne COVID-19 particles can travel, previous research on influenza found that viral particles may travel upward of 30 feet in the air.

To be clear, this is only a concern in shared public places. At home, the risk of contracting COVID-19 through air currents or air conditioning units is no more likely than spreading the virus through close contact or touching contaminated surfaces.

And it's not just warm weather and air conditioning that poses a threat. Cold weather in the winter that similarly forces people to go inside and crank the heat also creates an environment with little ventilation where viral particles can be spread through the air and cause infection. Ride-sharing services and taxis are another place where you may be in a closed space with someone who is infected. Virus particles could spread through air currents in the car, Karan points out.

Whether you're taking a taxi or escaping the heat or cold indoors, Karan's advice is the same.

"I would say keep the windows open and talk to your employers about [whether] they're looking into air filtration systems that are able to filter a wide range of particles," he says. He also adds that we need to design a better protective mask, one that can filter out the virus and is comfortable enough to wear all day.

To Karan, the looming question is: How do we live safely indoors with COVID-19?

That is the next frontier.

Correction

Aug. 18, 2020

An earlier version of this story incorrectly described the air exchange that occurs with an HVAC system and did not explain that these systems bring in outdoor air and send out an equal amount of indoor air.

covid covid-19 air particles virus

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